Listing of Claims:

1. (Currently amended) A method of depositing a metal-containing capping layer on metal portions of a substrate containing a layer of metal and dielectric, the method comprising:

(a) receiving the substrate containing the layer of metal and dielectric;

(b) wet etching metal from the substrate from a position above or coplanar with an upper level of dielectric to a position below the [[an]] upper level of exposed dielectric in the layer by contacting the substrate with a wet etching solution; and

(c) forming the capping layer on at least exposed metal portions of the substrate by electroless deposition.

2. (original) The method of claim 1, wherein the metal of the layer is copper or a copper alloy.

3. (original) The method of claim 1, wherein the capping layer comprises a refractory metal.

4. (original) The method of claim 1, wherein the capping layer comprises cobalt.

5. (original) The method of claim 1, wherein the metal of the layer is etched to a position below the level of the exposed dielectric that is approximately equal to or lower than a target thickness of the capping layer.

6. (original) The method of claim 1, wherein the capping layer is between about 30 and 500 Angstroms thick.

7. (canceled)

8. (currently amended) The method of claim [[7]] 1, wherein the etching solution oxidizes the metal of the substrate to a metal oxide.

9. (original) The method of claim 8, further comprising removing the metal oxide so that the exposed metal portions attain said position below the upper level of the exposed dielectric.

10. (original) The method of claim 9, wherein removing the metal oxide comprises contacting the substrate with an oxide etchant that selectively removes the metal oxide and not the metal.

11. (original) The method of claim 10, wherein the oxide etchant comprises glycine.

12. (original) The method of claim 10, wherein the oxide etchant comprises a complexing agent for ions of the metal.

13. (original) The method of claim 9, wherein oxidizing the metal of the substrate to a metal oxide and removing the metal oxide takes place in one etching solution.

14. (original) The method of claim 8, wherein the etching solution comprises an oxidizing agent selected from the group consisting of a peroxide, a permanganate, ozone, and a persulfate.

15. (original) The method of claim 8, wherein the etching solution further comprises a corrosion inhibitor.

16. (currently amended) The method of claim [[7]] 1, wherein the etching solution comprises an acid.

17. (currently amended) The method of claim [[7]] 1, wherein the etching solution further comprises a surfactant.

18. (currently amended) The method of claim [[7]] 1, wherein the etching solution directly etches the metal of the substrate without producing an insoluble metal oxide.

19. (original) The method of claim 18, wherein the etching solution is acidic.

20. (original) The method of claim 19, wherein the pH of the etching solution is between about 1 and 4.

21. (original) The method of claim 18, wherein the etching solution comprises a corrosion inhibitor.

22. (original) The method of claim 18, wherein the etching solution comprises a complexing agent.

23. (original) The method of claim 18, wherein the etching solution comprises a surfactant.

24. (currently amended) The method of claim [[7]] 1, wherein contacting the substrate with an etching solution comprises dipping, spraying or using a thin film reactor.

25. (currently amended) ~~The method of claim 1, wherein etching metal comprises~~ A method of depositing a metal-containing capping layer on metal portions of a substrate containing a layer of metal and dielectric, the method comprising:

(a) receiving the substrate containing the layer of metal and dielectric;

(b) etching metal from the substrate from a position above or coplanar with an upper level of dielectric to a position below the upper level of exposed dielectric in the layer by contacting the substrate with an oxidizing gas that oxidizes the exposed metal to a metal oxide and further contacting the substrate with a metal oxide etching agent to remove the metal oxide; and

(c) forming the capping layer on at least exposed metal portions of the substrate by electroless deposition.

26. (original) The method of claim 25, wherein the oxidizing gas comprises oxygen.

27. (original) The method of claim 26, wherein the oxidation occurs at a temperature between about 200 and 300 degrees Celsius and at a pressure between about 50 and 180 Torr of oxygen.

28. (original) The method of claim 1, further comprising performing a post-etch treatment of the substrate prior to forming the capping layer.

29. (original) The method of claim 28, wherein the post-etch treatment of the substrate involves cleaning the etched metal portions of the substrate prior to forming the capping layer.

30. (original) A method of claim 1, wherein forming the capping layer on the etched metal portions of the substrate by electroless deposition comprises:

forming a metal nucleation layer on the exposed metal portions of the substrate by electroless deposition from a first solution comprising metal ions; and

forming a bulk metal layer on the metal nucleation layer by electroless deposition from a second solution comprising metal ions and a reducing agent that promotes electroless deposition on elemental metal surfaces.

31. (original) A method of claim 30, wherein the metal capping layer comprises cobalt.

32. (original) The method of claim 30, wherein the first solution comprises cobalt ions and a water-soluble borane compound.

33. (original) The method of claim 30, wherein the reducing agent of the second solution comprises a hypophosphite.

34. (original) The method of claim 1, further comprising performing a post-deposition anneal of the capping layer.

35. (original) The method of claim 1, further comprising nitriding the capping layer.

36. (original) The method of claim 1, wherein the substrate received in (a) comprises exposed regions of dielectric.

37. (original) The method of claim 1, wherein the substrate received in (a) comprises metal covering the upper level of dielectric.

38. (Currently amended) A method of depositing a metal-containing capping layer on metal portions of a substrate containing a layer of metal and dielectric, the method comprising:

receiving the substrate containing the layer of metal and dielectric;

wet etching metal from the substrate from a position above or coplanar with an upper level of dielectric to a position below the [[an]] upper level of exposed dielectric in the layer by contacting the substrate with a wet etching solution; and

forming the capping layer on at least exposed metal portions of the substrate.

39. (original) The method of claim 38, wherein forming the capping layer comprises a process selected from the group consisting of physical vapor deposition (PVD) followed by planarization, selective chemical vapor deposition (CVD) on the exposed metal portions of the substrate, atomic layer deposition (ALD), selective reduction of an organometallic precursor from a supercritical solution, and electroless deposition.

40. (original) The method of claim 38, wherein the capping layer comprises a material selected from the group consisting of cobalt, palladium, ruthenium, platinum, tungsten, lead,

cadmium, tantalum, tantalum nitride, nickel, titanium, titanium nitride, molybdenum, and combinations and alloys thereof.

41. (original) The method of claim 40, wherein the capping layer further comprises a non-metallic element selected from the group consisting of boron, phosphorus, carbon, silicon, nitrogen, and sulfur.

42. (original) The method of claim 38, wherein the metal layer in the substrate is copper or a copper alloy.

43. (Currently amended) A method of etching metal portions of a substrate containing a layer of metal and dielectric, the method comprising:

receiving the substrate containing the layer of metal and dielectric; and

etching metal from the substrate to a position below an upper level of exposed dielectric by contacting the substrate with [[an]] a wet etching solution comprising between about 0.05% and 15% glycine by weight and between about 0.5% and 20% peroxide by weight, at a pH in a range of between about 5 and 12, wherein the etching is accomplished by contacting at least the metal with an etching solution, wherein the contacting comprises at least one of immersing, spraying, dipping, spin on contact, and using a thin film reactor.

44. (original) The method of claim 43, wherein the peroxide is H_2O_2.

45. (original) The method of claim 43, wherein the etching solution has a pH in a range of between about 6 and 10.

46. (original) The method of claim 43, wherein the etching solution comprises about 1% by weight glycine and about 3% by weight H_2O_2.

47. (original) The method of claim 43, further comprising forming a capping layer on the etched metal portions of the substrate.

48. (Currently amended) A method of etching metal portions of a substrate containing a layer of metal and dielectric, the method comprising:

receiving the substrate containing the layer of metal and dielectric, wherein substrate comprises overburden covering dielectric field regions; and

etching metal from the substrate to expose the dielectric field regions by contacting the substrate with [[an]] a wet etching solution comprising between about 0.05% and 15% glycine by weight and between about 0.5% and 20% peroxide by weight, at a pH in a range of between

about 5 and 12, wherein the etching is accomplished by contacting at least the metal with an etching solution, wherein the contacting comprises at least one of immersing, spraying, dipping, spin on contact, and using a thin film reactor.

49. (previously presented) The method of claim 48, wherein the peroxide is H_2O_2.

50. (previously presented) The method of claim 48, wherein the etching solution has a pH in a range of between about 6 and 10.

51. (previously presented) The method of claim 48, wherein the etching solution comprises about 1% by weight glycine and about 3% by weight H_2O_2.

52. (previously presented) The method of claim 48, further comprising forming a capping layer on the etched metal portions of the substrate.

53. (previously presented) The method of claim 48, wherein the metal is copper.

54. (previously presented) The method of claim 48, further comprising, prior to the etching, planarizing the substrate surface.

55. (previously presented) The method of claim 54, wherein the planarization is chemical mechanical polishing.

56. (previously presented) The method of claim 54, wherein the planarization is an electroplanarization technique.

57. (Currently amended) A method of etching metal portions of a substrate containing a layer of metal and dielectric, the method comprising:

receiving the substrate containing the layer of metal and dielectric, wherein the substrate comprises overburden covering dielectric field regions;

at least partially completing planarization of the overburden; and

etching to remove the remaining overburden to on the substrate by contacting the substrate with [[an]] a wet etching solution at a pH in a range of between about 5 and 12 and comprising (i) a complexing agent for ions of the metal and (ii) an oxidizer selected from the group consisting of peroxides, permanganates, persulfates, and ozone solution, wherein the etching is accomplished by contacting at least the metal with an etching solution, wherein the contacting comprises at least one of immersing, spraying, dipping, spin on contact, and using a thin film reactor.

58. (previously presented) The method of claim 57, wherein etching solution further comprises a surfactant.

59. (previously presented) The method of claim 57, wherein the etching solution further comprises a corrosion inhibitor.

60. (previously presented) The method of claim 57, wherein the oxidizer is hydrogen peroxide.

61. (previously presented) The method of claim 57, wherein the etching solution comprises between about 0.05% and 15% glycine by weight and between about 0.5% and 20% peroxide by weight.

62. (previously presented) The method of claim 57, wherein the etching solution has a pH in a range of between about 6 and 10.

63. (previously presented) The method of claim 57, further comprising forming a capping layer on the etched metal portions of the substrate.

64. (previously presented) The method of claim 57, wherein the metal is copper.

65. (previously presented) The method of claim 57, wherein the planarization is chemical mechanical polishing.

66. (previously presented) The method of claim 57, wherein the planarization is an electroplanarization technique.

67. (Currently amended) A method of etching metal portions of a substrate containing a layer of metal and dielectric, the method comprising:

receiving the substrate containing the layer of metal and dielectric, wherein substrate comprises overburden covering dielectric field regions; and

etching to remove at least a portion of the overburden on the substrate by contacting the substrate with [[an]] a wet etching solution at a pH in a range of between about 5 and 12 and comprising (i) a complexing agent for ions of the metal and (ii) an oxidizer, wherein the etching is accomplished by contacting at least the metal with an etching solution, wherein the contacting comprises at least one of immersing, spraying, dipping, spin on contact, and using a thin film reactor.

68. (previously presented) The method of claim 67, wherein the oxidizer is selected from the group consisting of peroxides, permanganates, persulfates, and ozone solution.

69. (previously presented) The method of claim 67, wherein the etching solution comprises between about 0.05% and 15% glycine by weight and between about 0.5% and 20% peroxide by weight.

70. (previously presented) The method of claim 67, further comprising at least partially completing removing the overburden via chemical mechanical processing.

71. (previously presented) The method of claim 67, further comprising forming a capping layer on the etched metal portions of the substrate.

72. (previously presented) The method of claim 67, wherein the metal is copper.

73. (previously presented) The method of claim 67, wherein etching solution further comprises a surfactant.

74. (previously presented) The method of claim 67, wherein the etching solution further comprises a corrosion inhibitor.

75. (previously presented) The method of claim 67, wherein the etching solution has a pH in a range of between about 6 and 10.

76. (previously presented) The method of claim 67, wherein the etching solution comprises about 1% by weight glycine and about 3% by weight H_2O_2.